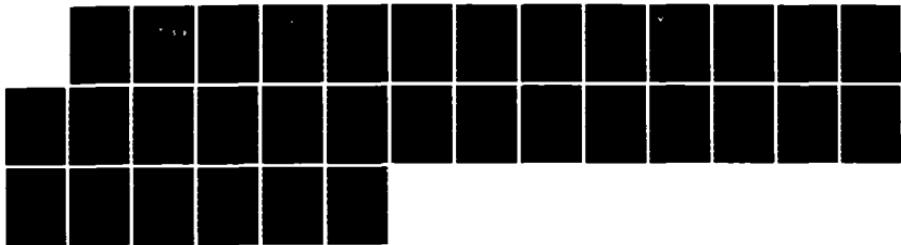
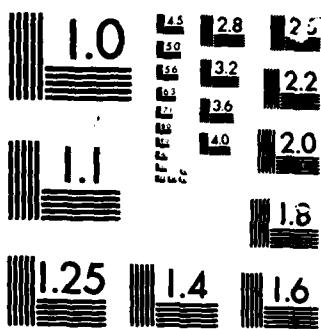


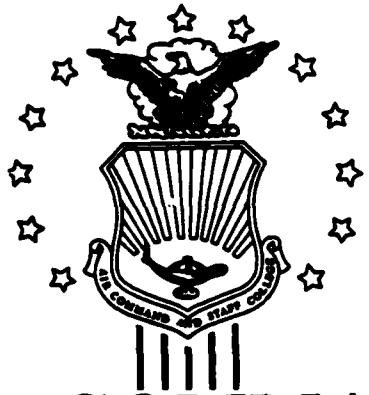
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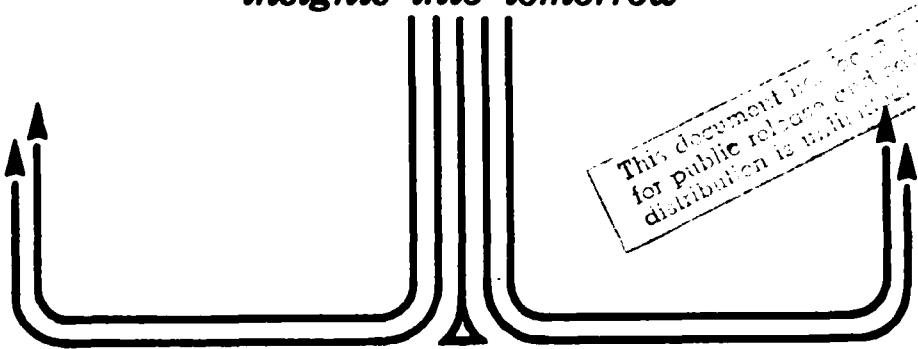
STUDENT REPORT

CIVIL RESERVE EMERGENCY AUGMENTATION
TELECOMMUNICATIONS (CREAT) PROPOSAL:
CIVIL/MILITARY INTEROPERABILITY

MAJOR CHARLES O. CORNELL 86-0600

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86-0600

TITLE

CIVIL RESERVE EMERGENCY AUGMENTATION
TELECOMMUNICATIONS (CREAT) PROPOSAL:
CIVIL/MILITARY INTEROPERABILITY

AUTHOR(S)

MAJOR CHARLES O. CORNELL, USAF

FACULTY ADVISOR

MAJOR LARRY G. ROSELAND, ACSC/EDCW

SPONSOR

MAJOR DAVID J. ADERHOLD, AF SPACE COMMAND/DOXS

Submitted to the faculty in partial fulfillment of
requirements for graduation.

**AIR COMMAND AND STAFF COLLEGE
AIR UNIVERSITY
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<p>The US has experienced a shortage of survivable satellite communication assets during previous crises. To obtain additional satellite communications capability, the US can buy more military systems or increase the interoperability between the civilian and military systems. The second choice provides an economical method of providing an expansion capability during crisis or war, as well as, increasing the survivability of the communications system through redundancy. This study proposes the Civil Reserve Emergency Augmentation Telecommunications (CREAT) program be established as the focal point for interoperability improvements. This program is based on the successful concepts used in the Civil Reserve Air Fleet (CRAF) program which provides civilian and military interoperability for airlift requirements.</p>			
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PREFACE

This report expands the ideas from a number of papers on interoperability between civilian and military satellite communication systems. It proposes a program to work towards the goal of interoperability by establishing civilian augmentation for military satellite communications in time of crisis and war. This study presents the organization, operations, funding, and legal details for the proposed Civil Reserve Emergency Augmentation Telecommunications (CREAT) program. This program is patterned after the Civil Reserve Air Fleet (CRAF) system which augments the United States military airlift capability.

A special word of thanks goes to several people for their assistance in preparing this report. Mr Willis E. Jorde, MSgt Thomas L. Philbrick and MSgt Everette L. Fike, from Headquarters, Electronic Security Command, were extremely helpful in obtaining the communications cost data. Major Larry G. Roseland, the project advisor, and Major David J. Aderhold, project sponsor, provided significant editing assistance and project guidance. Finally, a special thanks to my wife, Susan, and daughter, Hannah, for their help and support.

ABOUT THE AUTHOR

Major Charles O. Cornell began his military career at the United States Air Force Academy where he graduated in 1973. His first assignment was as Test Engineer evaluating electronic warfare equipment for the 3246th Test Wing at Eglin Air Force Base, Florida, where he flew over 200 hours as a non-rated crew member. After receiving his Master of Science Degree in Electrical Engineering from the Air Force Institute of Technology (AFIT), Wright-Patterson Air Force Base, Ohio, in 1978, he worked as a Computer Systems Analyst for the Air Force Electronic Warfare Center at the Electronic Security Command (ESC), Kelly Air Force Base, Texas. His interest in space systems began with an assignment as the ESC commander of a small space unit in Colorado. His last assignment was as Director, Space Systems Engineering and Development, Space Directorate, ESC, Kelly Air Force Base, Texas. Major Cornell completed this study while a student in the Class of 1986 at the Air Command and Staff College, Maxwell Air Force Base, Alabama.

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REPORT NUMBER

86-0600

AUTHOR(S)

MAJOR CHARLES O. CORNELL, USAF

TITLE

CIVIL RESERVE EMERGENCY AUGMENTATION
TELECOMMUNICATIONS (CREAT) PROPOSAL:
CIVIL/MILITARY INTEROPERABILITY

I. Purpose: This study proposes a new program to focus attention on achieving interoperability between civilian and military satellite communication systems.

II. Problem: The US has experienced a shortage of survivable satellite communication assets during previous crises. There is a need for additional communication systems for use during crisis or war.

III. Discussion: To obtain additional satellite communications capability, the US can buy more military systems or increase the interoperability between the civilian and military systems. The second choice provides an economical method of providing an expansion capability during crisis or war, as well as, increasing the survivability of our communication systems through redundancy. This study proposes

CONTINUED

the Civil Reserve Emergency Augmentation Telecommunications (CREAT) program be established as the focal point for interoperability efforts. This program is based on the successful concepts used in the Civil Reserve Air Fleet (CRAF) program which provides civilian and military interoperability for airlift requirements.

IV. Recommendation: Civil/military satellite communications interoperability should provide an economic method of attaining a survivable expansion capability. The CREAT program provides a forum for implementing these interoperability reforms.

Chapter One

INTRODUCTION

Satellite systems are vitally important to the United States. Military satellites are a necessary and cost-effective means to observe vast areas of the globe and communicate between those areas. Command, control, communications and intelligence (C³I) systems, using military satellites, are critical to the success of the military in any crisis or war. However, experiences during past military crises reveal that US communication satellite systems can become the "Achilles' Heel" of the operations as well (7:36-37). As examples, the 1973 Arab-Israeli conflict caused a saturation of communications facilities (24:7-8) and the 1983 invasion of Grenada utilized amateur radio operators to solve some communication problems (9:52).

The recognition of the military shortfall in survivable C³I space assets during a crisis or war led to a number of studies examining the problem and proposing alternatives (21:--; 24:--). All studies express the desire for more satellite communication systems. This objective can be obtained in two ways: procuring new military systems or providing expansion capabilities via civil/military interoperability. The first alternative, procuring new military systems, is both expensive and hard to sell to a frugal Congress (7:37; 8:54). The second alternative, civil/military interoperability, offers the possibility of using civilian satellite communication systems without paying the full cost of operating and maintaining them during peacetime. In time of crisis or war, the civilian assets become the expansion capability needed to meet the military's communications shortfall (21:14).

The civil/military interoperability alternative provides another benefit: enhanced survivability. Col Robert B. Giffen in his monograph entitled US Space Survivability enumerates seven ways to approach satellite survivability (1:xiv). One of these approaches is proliferation of systems to prevent an adversary from "zeroing in on" a few key systems.

Civil/military interoperability in satellite communication systems will complicate the enemy's targeting by increasing the number of systems which must be destroyed to disrupt our military communications (24:85).

This paper concentrates on satellite communication systems for two reasons: practicality and economics. First, estimates show that the DoD uses satellite communications for up to 70 percent of their long-distance communications needs (7:37). This makes satellite communication systems the ideal starting place for expansion initiatives. Second, while communication systems must be survivable in wartime, they must be affordable in peacetime. Satellite communication systems currently cost only 20 percent of other forms of long-distance communications (21:13). Thus it is cost effective to emphasize the use of satellite communication systems. For all of the above reasons, the initial efforts should concentrate on interoperability between civilian and military satellite communication systems.

Headquarters, Air Force Space Command suggested the creation of a new program, patterned after the Civil Reserve Air Fleet (CRAF) program, to achieve the interoperability goals. This study will explore the implementation of this program, to include its organization, operational concepts, funding, and legality. But first, a brief organizational review of the existing US communication satellite structure is necessary to understand the problems of achieving civil/military interoperability during crisis or war.

Chapter Two

BACKGROUND

The history of communications in the United States is marked by unguided growth. Unlike many other countries, the US has no cabinet level Department of Communications controlling all communication activities. Col Robert A. Reinman, Director of the Command & Control Engineering Center for the Defense Communications Agency (DCA), wrote a paper (2:--) for the National Defense University entitled National Emergency Telecommunications Policy: Who's in Charge? He argues nobody is in charge since responsibility for policy below the President is delegated to numerous government organizations with ambiguous and sometimes overlapping charters (20:89). Reliance upon communication planners abiding by constraints imposed by numerous federal agencies like the Office of Science and Technology, Federal Emergency Management Agency, Federal Communications Commission and the Department of Defense has resulted in unsynchronized growth of both the civilian and military sectors. This uncontrolled approach lacks a central authority for setting policy, and therefore, abrogates responsibility for obtaining survivable emergency communications solely to the military.

From the beginning of satellite communications in the US, roles were divided between military and civilian interests. Secretary of Defense Robert S. McNamara instituted a study in mid-1963 to determine whether the newly created civilian Communications Satellite Corporation could meet the needs of the military. The study concluded that civilian and military satellite communications systems should develop separate systems (17:51-70). The following reasons were presented for separate systems:

1. The military had immediate requirements while civilian requirements were just evolving.
2. Economy in a combined system was dubious since the civilian and military communication frequencies are different and require separate types of equipment.
3. The military inability to authorize money for more than one year at a time would complicate sole-source procurement.

4. International complications would result from the requirement for US military control at both ends of overseas-CONUS links, while the civilian sector should interface directly with foreign-controlled satellite earth terminals.

5. Divergent missions exist with the military needing survivable, secure, anti-jam, tactical service, while the civilian sector wanted expansion capacity, broad access, reliability, and commercially competitive service. This results in different directions for improvements when excess space or weight is found during satellite development.

6. Adding military requirements to the Communications Satellite Corporation would require rewriting the Communications Satellite Act of 1962 placing additional stress on the newly evolving company.

Many of the reasons presented in 1963 still apply today for separate military and civilian satellite systems, however, one factor has changed: the need for survivability.

The need for survivable communications for national security and emergency preparedness (NSEP) was one reason for the efforts to organize the numerous government and civilian communication entities into a common structure. By Presidential Memorandum of 21 August 1963, the National Communications System (NCS) was formed consisting of representatives from the Federal agencies that owned or leased telecommunication assets (5:18). In September 1982, Presidential Executive Order 12382 entitled "President's National Security Telecommunications Advisory Committee" created the NSTAC to be the President's technical advisor on measures to improve our national security telecommunications (18:--; 24:1). On 13 June 1983, National Security Decision Directive Number 97 entitled "National Security Telecommunications Policy" established the policy and management framework for the NCS (20:12). Last in this set of actions, Executive Order 12472 entitled "Assignment of National Security and Emergency Preparedness Telecommunications Functions" was signed on 3 April 1984 designating the Secretary of Defense as the Executive Agent of the NCS, and the Director of the Defense Communications Agency (DCA) as the Manager of the NCS (5:89; 19:--; 21:18-19). These decisions provide the organizational framework for any proposal to enhance NSEP communications and civil/military interoperability.

At their first meeting in late 1982, the NSTAC recognized the need to develop an interoperable and survivable system from the divided military and civilian satellite industries. To

accomplish this, the Commercial Satellite Survivability (CSS) Task Force was established. The Task Force published its report entitled "Commercial Satellite Communications Survivability Report" on 20 May 1983 with the following recommendations:

1. ... the Government establish a commercial satellite communications survivability program with appropriate funding ...
2. ... the Government establish a CSS Program Office to coordinate the program ...
3. ... the CSS Program Office ... should ... develop emergency plans and procedures to assure ... the restoration of commercial satellite communications services under ... emergency conditions ...
4. The development of a capability for communications interoperability at critical earth stations ...
5. The development of a capability utilizing the Digital Encryption Standard (DES) algorithm to protect digital communications links, if ... required by the Government.
6. ... enhance the survivability of satellite control systems ... to achieve command link protection.
7. The development of control interoperability between satellite systems ...
8. ... increase physical security of satellite control facilities and communications earth stations.
9. ... initiate a study which would assess the susceptibility of existing commercial satellite communications systems to nuclear effects and provide recommendations which would establish hardening guidelines for future commercial satellite programs.

(24:2-3)

With the divestiture of the American Telephone & Telegraph Company (AT&T), the need for NSEP communications received special recognition in two areas. First, Federal District Court Judge Harold H. Greene, who presided over the divestiture

proceedings of AT&T, ruled in his modification to Final Judgement that AT&T should remain the single point of contact for a small number of critical NSEP communications systems. The Bell Communications Research, Inc. a special branch of AT&T (commonly known as the Bellcore NSEP group) ensures special programs such as White House communications receive centralized and total support. Secondly, the NSTAC created the National Coordination Center (NCC) to help in the coordination of general problems in the new multi-carrier communications environment caused by the divestiture. The NCC is made up of the 10 telecommunications firms which provide approximately 97 percent of the leased circuits to the government (5:86). These two organizations keep current NSEP communications operating but do not provide solutions for future policy planning, emergency expansion of communications, nor civil/military interoperability reform.

To use interoperability during a crisis or war, the military must obtain control of the civilian communication satellite assets for achieving expandability and survivability. Government satellites are always under the control of the National Command Authority (NCA). US commercial satellites, on the other hand, are civilian assets controlled by their respective companies in accordance with international law and US regulations. In case of general war, the civilian systems could only be controlled if nationalized in accordance with the Title 47, Section 706 of the 1934 Communications Act as amended (21:18). For national disasters, the civilian systems can be nationalized in accordance with the Disaster Relief Act of 1974, Public Law 92-388 (3:65). A program to implement interoperability in these situations is required.

The next chapter proposes an implementation solution for achieving expandability and survivability goals through an interoperability program.

Chapter Three

PROPOSAL

The US requires a program to develop the plans and procedures necessary for civilian and military interoperability. The rationale for establishing a new program is that it will form a focal point for studying, funding and implementing changes to increase communications interoperability. A successful program was needed to use as a model of civil/military interoperability.

SIMILARITY TO AIRLIFT REQUIREMENTS

The United States faced a similar situation during the 1940's in the area of civilian and military air transportation. The need for civilian airline augmentation was demonstrated in World War II, the Berlin Blockade and Korea. These conflicts raised questions of interoperability requiring definition of roles, identification of procedures and commonality of equipment. The National Security Resource Board studied the situation and recommended a military air component augmented by a civilian air reserve component in time of conflict. The creation of the Civil Reserve Air Fleet (CRAF) by Executive Order 10219 in February 1951 resulted. The CRAF program continues today with some slight changes (16:--; 22:--; 23:--). A similar system might be possible for augmenting military satellite communications in crisis or war.

CIVIL RESERVE EMERGENCY AUGMENTATION TELECOMMUNICATIONS

A program, tentatively called the Civil Reserve Emergency Augmentation Telecommunications (CREAT pronounced create) program, would be the focal point for achieving the interoperability goals. It borrows several ideas and concepts from the successful practices of the CRAF system (16:--; 23:--). These ideas and concepts have been extrapolated to address the problems of civilian and military satellite communications interoperability. The remainder of this chapter discusses the organization, activation details, contracting, allocation of services, funding mechanisms, and legality of this proposal for the CREAT program.

ORGANIZATION

The CREAT program should be assigned to the National Communications System (NCS) with the Director, Defense Communications Agency (DCA) in charge. This places the commercial companies, federal national security and emergency preparedness (NSEP) agencies and the Department of Defense (DoD) under one manager to support the program. DoD management of the program is logical since the majority of the NSEP expertise resides in the DoD. DCA control of the CREAT program would seem to be consistent with the charter of DCA in the 5 July 1962 directive of Secretary of Defense McNamara (17:9). This structure avoids creating another new organization to further complicate the communications arena.

ACTIVATION DETAILS

The CREAT program should revolve around an incremental activation system by which the government chooses an option to meet its requirements. This incremental activation would consist of three levels. The first level, Stage I, should commit a minimal set of services to expand the government communication capabilities beyond normal with minimal impact to civilian users. This level will be used for exercising the system and handling minor communication emergencies. The activation of Stage I would require the authorization of the Director, DCA. Stage II should commit additional civilian communication resources required to support a communications emergency not warranting full nationalization. The activation of Stage II would require the authorization of the Secretary of Defense. The last level, Stage III, would be the nationalization of civilian communications in response to a national emergency. Survival of the US communications capabilities would be required for conducting the war and reconstituting the Government. The activation of Stage III would require the declaration of a national emergency by the President or the US Congress. The activation of each phase relies on previous contractual planning.

CONTRACTING

The key to the CREAT program is the contractual planning and negotiations conducted before the emergency satellite communications are required. Experience in the CRAF shows that two forms of contracts are needed: an annual service contract and a call contract (23:11). An annual communications service contract should be used for known, annual operational costs for the CREAT program. Additionally, the annual contract should

provide for reimbursement of the carrier's expenses for services such as technical assistance, participation in meetings, exercise planning, and documentation support. The CREAT call contract establishes the legal obligation to perform and basis for payment for all services provided when the system is activated in time of exercise or emergency. This contract would remain unused unless the CREAT program was activated.

All facets of the program should be covered by contracts negotiated using the prevailing Federal Communications Commission (FCC) tariff rates. This would provide a fair and equitable compensation rate for each participating company if their satellite communication systems are nationalized and eliminates the necessity for price renegotiations each year. A similar practice for determining rates has worked for the CRAF program for a number of years (23:11). The awarding of these contracts should conform to a number of allocation rules.

ALLOCATION OF SERVICES

Central to the CREAT program are three concepts for allocating service contracts to civilian communication satellite companies. First, the commercial satellite communications carriers should be awarded a percentage of the government's peacetime communications contracts in relation to the percentage of support provided to the CREAT program (23:11). This will incentivize participation in the program and allow maximum use of the interoperability features during peacetime operations. Secondly, a commercial satellite communications carrier should not have a majority of its utilization allocated to routine government commitments. Even in time of crisis or war, civilian business interests must be able to function to prevent the collapse of the economic sector. Additionally, if the communication users, which are displaced by CREAT activation are other government users, very little useful expansion capability is created. Consequently, the proper balance of civilian, government and CREAT expansion users must be maintained over each satellite system. Finally, the commercial satellite communications carriers should emphasize interoperability with the military's long-haul administrative communications while leaving the military to provide the specialized tactical communications needs. This allows the commercial systems to provide interoperable services similar to their normal operations without numerous, specialized CREAT-only requirements. Further, by permitting the removal of administrative communications from the military

systems in time of CREAT activation, it creates greater tactical communications capability for the military users. Analogies to these concepts can be found in the successful policies of the CRAF program. These services can be funded in numerous ways.

FUNDING MECHANISMS

There are five methods of funding which could be used to influence changes in the civilian satellite communications industry to obtain interoperability: voluntary, statutory, governmental prerequisite, non-fiscal incentives and investment (24:87-89). A mixture of these funding mechanisms should be used to minimize the cost of the CREAT program.

Voluntary

The first category is voluntary financing of interoperability features by industry. This is often done to foster good public relations, ensure long-term compatibility, and promote items of interest to the company. An excellent example would be security measures to protect the earth terminal assets which increase the survivability of the assets for both the company and the CREAT program. The CREAT program will be the advocate and information broker to influence industry to incorporate survivability and interoperability features in new designs.

Statutory

The next category of funding involves the enactment of statutes, regulations and standards to ensure survivability and interoperability goals are incorporated in designs and operations. This affects small design or operational changes that equate to little additional cost. As a system advocate, the CREAT manager is instrumental in forming these compliance standards.

Governmental Prerequisite

More expensive standards can be imposed on companies that hold large government contracts as a prerequisite for doing business with the Government. For example, the Government will no longer transmit communications over commercial satellites without encrypted command links starting in 1987 (5:88). The principle of designating only commercial carriers with government contracts as CREAT participants ensures availability of these features.

Non-fiscal Incentives

This category involves non-fiscal incentives and compensation the government can provide to companies that make investments towards survivable and interoperable systems. Examples of this include payload priority for launching satellites and tax credits for interoperable systems. Participation in the CREAT program could be made a requirement for such incentives.

Investment

Finally, the funding of major changes that are too expensive for industry to undertake voluntarily must be provided by the government. The CREAT program would concentrate on the previous four funding mechanisms to produce an evolutionary change towards interoperability using financial investment as a last resort. The funds to procure commercial satellite communications equipment may be necessary to achieve the first goals of interoperability for CREAT in a reasonable time frame. The next area of concern is the legality of implementing the CREAT program.

LEGALITY

To assess the legality of the CREAT program, a number of issues must be addressed. First, the legality of nationalizing the civilian satellite communication system seems very clear. Title 47, Section 706 of the 1934 Communications Act, as amended, (called Section 606 until 1984) provides the President with authority to nationalize the communications industry under conditions of crisis or national emergency (12:560). This includes suspension of regulations on system's use and compensation for use by the Government. Additionally, the Disaster Relief Act of 1974 provides authority for the President to nationalize communications during national disasters (3:65). These features fully support the CREAT concept. (Incidentally, the CRAF program, with a very similar structure and legal basis, has existed for 35 years without any legal problems; however, it has never been exercised.)

The federal government's position as the advocate of interoperability through the CREAT program produces a more difficult problem. Commercial satellite communication systems are common carrier systems controlled by rules and regulations (12:571). However, recent legal decisions have led to deregulation and competition within the satellite communications field. An example is the new Presidential

decision concerning the Communications Satellite Act of 1962 (10:80). It states the national interest is best served by restricted competition between INTELSAT Corporation (a regulated monopoly) and other satellite communication companies. This forces the reliance on anti-trust laws to protect the telecommunications market. Government/commercial joint ventures are usually given anti-trust immunity. Additionally, anti-trust legislation is currently under review for cases where a common good may result (4:49, 11:39). The question whether the CREAT program violates anti-trust legislation depends on the fair and equitable treatment of all competitors by the government (24:77-79). No aspect of the CREAT proposal would prevent such fair and equitable treatment.

This forms the organization, activation, allocation, funding, and legality of emergency services for the CREAT program. For the CREAT program to provide expanded service and increased survivability to the Government in time of crisis, a level of interoperability between the civilian and military satellite communication systems must be obtained. The next chapter will discuss how the CREAT program can become the focal point for improving interoperability.

Chapter Four

INTEROPERABILITY

While the CREAT program will exist as the planning and execution entity to respond to emergency communication needs in a crisis or war, the program also provides a central point for implementing changes towards a greater degree of interoperability between the civil and military satellite communication systems. This chapter will discuss interoperability: ways to categorize it, steps to achieve it and current efforts related to it.

CATEGORIZING INTEROPERABILITY

The Communication Satellite Survivability (CSS) Task Force concluded that to meet the survivability and expandability goals, the civilian and military satellite systems must work towards interoperability. Mr Gilbert E. LaVean of the Defense Communications Agency (DCA) proposed a 7-level model of interoperability between satellite communication systems (6:1448). The model distinguishes levels of interoperability using both electronic and management interface distinctions (see Table 1). The CSS Task Force placed the interoperability of current civilian and military communication satellite systems between level one and level two (24:29). This translates to little compatibility between most systems with some agreements to share resources when possible. Mr LaVean recognized complete interoperability was not realistic since there are differing requirements and conflicting design criteria for our satellite communication systems. He concluded that the US should: first, determine the interoperability modes that are necessary; second, establish measurable goals to obtain these modes early in the design process; and third, ensure those interoperability goals are met by the systems produced (6:1452-1453). The CREAT program can be the central program for guiding the design of new systems towards these interoperability goals.

<u>LEVEL</u>	<u>NAME</u>	<u>SYSTEM</u>	<u>CONTROL</u>
1	Separate Systems	Different Equipment	Separate Management
2	Shared Resources	Different Equipment	Non-interference Sharing
3	Gateway Interface	Single Interface	Non-interference Sharing
4	Multiple Entry	Many Interfaces	Prioritized Users
5	Compatible Systems	Compatible Equipment	Prioritized Users
6	Interoperable Systems	Compatible Equipment	Single Manager
7	Single System	Same Equipment	Single Manager

TABLE 1. Interoperability Model (6:1448)

<u>EQUIPMENT</u>	<u>COST</u>
C-Band Terminal Interface Equipment	\$350,000.00 50,000.00
<u>SERVICE</u>	<u>COST</u>
Colorado Springs, CO to Baltimore, MD	\$17,000.00
Colorado Springs, CO to San Francisco, CA	22,000.00
(4800 Baud, Point-to-Point circuit; cost per month)	

TABLE 2. Communication Equipment and Service Costs (25:--)

FIRST STEP TOWARDS INTEROPERABILITY

The CSS Task Force's near-term proposal to achieve interoperability involves the development of gateways between the civilian and military satellite systems. A method to accomplish this is an alternate communications link between designated military earth terminals and commercial earth terminals. This allows routing military communications traffic to a commercial carrier for transmission over a commercial satellite. One problem with this solution is that military satellite communications are often between CONUS and overseas locations. Overseas locations involve international communication carriers which will not be responsive to a US activation of the CREAT program. Therefore, overseas locations require a dedicated, military controlled, gateway earth terminal using commercial equipment. This configuration would provide the first step towards interoperability with minimum costs and off-the-shelf equipment.

Sample cost figures are provided for a voice grade line from a central US location (Colorado) to a European or Pacific location (see Table 2). Dedicated lines would be leased from the central US location to commercial satellite communication terminals on the coasts. After interfacing with the commercial satellite earth terminal, the line is transmitted via the commercial satellite to a C-Band commercial terminal overseas which is operated by and co-located with the military. Such a system could support many more lines with the addition of interface equipment and lines to the commercial earth terminal. Additionally, the number of gateways can be increased as necessary to produce a viable CREAT program.

The CSS Task Force's long-term goals for interoperability involve: first, the influencing of commercial system design to incorporate survivability criteria like those for military systems; and second, the procurement of compatible equipment for military systems to allow access to civilian satellite systems (24:34). The CREAT program will be instrumental in attaining these goals as a focal point with incentivized funding.

INTEGRATION WITH OTHER EFFORTS

The CREAT program should be integrated with other interoperability programs currently planned. The Air Force Space Plan Working Group recently tabled their action items on civil/military satellite interoperability to await tasking from the Unified Space Command (15: Action Item 10). Also, the DCA

Military Satellite Office is sponsoring an Aerospace Corporation and AT&T Company study on interoperability with results expected in mid-1986. A CREAT program office should coordinate these various efforts.

Additionally, the CREAT program should be integrated with the survivability programs already in existence. Coordination with the Office of Science and Technology Policy (OSTP), which is responsible for emergency telecommunications management, is essential to maximize the economic savings possible through civil/military interoperability (13:722). The use of civilian satellite communication assets will probably require revising the existing operations plans for assuming military control of civilian facilities in time of crisis (14:--). The CREAT program would establish a focal point for implementing the interoperability studies and coordinating their changes with other emergency telecommunication and survivability programs.

Chapter Five

RECOMMENDATIONS

The military needs more satellite communications capability to meet its demands during crisis or war. The US must take measures to decrease our communication needs or increase our communications capability. The military has begun purchasing new satellite communication systems, however, this option is increasingly expensive. Interoperability between civilian and military satellite communication systems provides increased capability with two benefits: economy and survivability. First, interoperability would allow expansion of the communications circuits available to the military during crisis or war without burdening the military with the expense of systems operation and maintenance during peacetime. Secondly, interoperability complicates the enemy's targeting of the US military communications and provides redundancy and flexibility to the US. A balance between military satellite communication systems and interoperability with civilian systems will produce the best performance at the least cost. The Civil Reserve Emergency Augmentation Telecommunications (CREAT) program would provide a focal point for evolving the desired balance of civil/military interoperability.

The author recommends Air Force Space Command become the advocate of the CREAT program to fulfill the Unified Space Command's action items for civil/military interoperability. As the Air Force advocate, Space Command should contract for a more rigorous system's architecture study from the telecommunications industry to obtain better cost data. Then, the CREAT program proposal should be staffed for HQ USAF, Joint Chiefs of Staff, Department of Defense, and Presidential approval.

The military must take a step towards interoperability. "There is a fairly well-established need for telecommunication interoperability within the United States which has not been met and may only get worse" (6:1452). This proposal, if implemented, would help reverse this trend.

BIBLIOGRAPHY

Books

1. Giffen, Robert B., Col, USAF. US Space System Survivability. Monograph Series 82-4, Washington, DC: National Defense University Press, 1982.
2. Reinman, Robert A., Col, USAF. National Emergency Telecommunications Policy: Who's in Charge? Monograph Series 84-2, Washington, DC: National Defense University Press, 1984.

Articles and Periodicals

3. Belford, William B. "National Coordinating Center for Telecommunications." Signal: Journal of the Armed Forces Communications and Electronics Association, Vol. 40, No. 5, January 1986, pp. 61-68.
4. Corrigan, Richard. "To Trust or Antitrust." Technology Review, Vol. X, No. X, July 1983, pp. 49, 68.
5. Horgan, John. "Safeguarding the National Security." IEEE Spectrum, Vol. 22, No. 11, November 1985, pp. 84-89.
6. LaVean, Gilbert E. "Interoperability in Defense Communications." IEEE Transactions on Communications, Vol. Com-28, No. 9, September 1980, pp. 1448-1453.
7. Lerner, Michael A. and Mary Lord. "Our Achille's Heel." Newsweek, Vol. CI, No. 18, 2 May 1983, pp. 36-37.
8. Powers, Winston D., Lt Gen, USAF and Andrew M. Hartigan. "The Defense Satellite Communications System." Signal: Journal of the Armed Forces Communications and Electronics Association, Vol. 39, No. 11, July 1985, pp. 53-59.
9. Schemmer, Benjamin F. "Grenada Highlighted One of DoD's Major C' Problems, But Increased Funding Is Bringing Solutions." Armed Forces Journal International, Vol. 121, No. 7, February 1984, pp. 50-53.

CONTINUED

10. Schneider, William, Jr. "Communications Satellite Systems." Department of State Bulletin, Vol. 85, No. 2102, Washington, DC: Government Printing Office, September 1985, pp. 80-83.
11. White, Lawrence J. "Clearing the Legal Path to Cooperative Research." Technology Review, Vol. X, No. X, July 1985, pp. 39-44.

Official Documents

12. US Code, Title 47 - Telegraphs, Telephones and Radio-telegraphs. Vol. 18, Washington, DC: Government Printing Office, 1983, pp. 560-571.
13. US Code of Federal Regulations, Title 47 - Telecommunications, Washington, DC: Government Printing Office, October 1983, pp. 716-734.
14. US Department of the Air Force: Air Force Communications Command, Continental Communications Division. Emergency Military Assumption of Operations and Maintenance Responsibilities Normally Provided by Civilian Contractors. Continental Communications Division Operations Plan 82. Griffiss AFB, New York, 30 September 1985. FOR OFFICIAL USE ONLY.
15. US Department of the Air Force: HQ Air Force Space Command. "AF Space Plan Working Group Minutes." Peterson AFB, Colorado: AFSPACECMD/XPXI, 3 February 1986. SECRET--NATIONAL SECURITY INFORMATION. Classified by Multiple Sources. Declassify on OADR. Unclassified information only used from this source.
16. US Department of the Air Force: Military Airlift Command. Operations Civil Reserve Air Fleet (CRAF). Military Airlift Command Regulation 55-8. Washington, DC: Government Printing Office, 28 December 1984.

CONTINUED

17. US House of Representatives: Military Operations Subcommittee of the Committee on Government Operations. Satellite Communications (Military - Civil Roles and Relationships). Subcommittee Report, 88th Congress, Second Session. Washington, DC: Government Printing Office, 1964.
18. US Presidential Executive Order 12382. "President's National Security Telecommunications Advisory Committee." Federal Register, 13 September 1982, pp. 40531-40532.
19. US Presidential Executive Order 12472. "Assignment of National Security and Emergency Preparedness Telecommunications Functions." Federal Register, 5 April 1984, pp. 13471-13478.

Unpublished Materials

20. Donahue, William J., Col, USAF. "Telecommunications for National Security and Emergency Preparedness: Outlook for the Future." Strategic Studies Project 85-59, National War College, National Defense University, Washington, DC, March 1985. US GOVERNMENT AGENCIES ONLY.
21. Leidenheimer, John L. Jr., Col, USAR. "Allocation of Communications Satellite Systems During Crisis and Conflict." Strategic Studies Project 85-97, National War College, National Defense University, Washington, DC, March 1985. US GOVERNMENT AGENCIES ONLY.
22. Roser, Steven A., Maj, USAF. "The Who, What and Why of the Civil Reserve Air Fleet." Unpublished Research Report 85-2240, Air Command and Staff College, Air University (ATC), Maxwell AFB, Alabama, 1985.

CONTINUED

23. Sable, Ronald K., Lt Col, USAF. "Civil Reserve Air Fleet (CRAF): A Primer for Defense and Industry." Unpublished Research Report MS025-79, Air War College, Air University (ATC), Maxwell AFB, Alabama, April 1979.
24. Skiver, David M., Capt, USAF. "Commercial/Military Communications Satellite Systems Interoperability." Master's Thesis 85-38T, University of Colorado, Air Force Institute of Technology (AU), Wright-Patterson AFB, Ohio, November 1984.

Other Sources

25. Philbrick, Thomas X., MSgt, USAF. Chief of Communications, Directorate of Space, Electronic Security Command, Kelly AFB, Texas. Telecon, 16 January 1986.

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